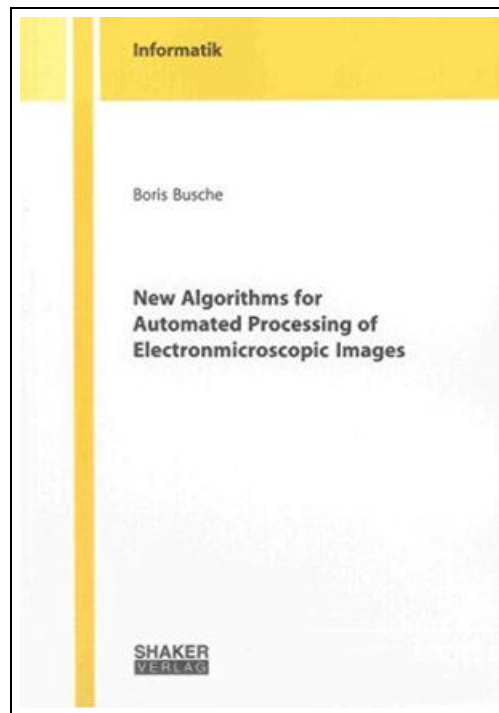


New Algorithms for Automated Processing of Electronmicroscopic Images



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Shaker Verlag Okt 2013, 2013. Taschenbuch. Condition: Neu. Neuware - To better understand macromolecular complexes and structures of proteins next to the functional analysis the three-dimensional (3D) structure of the molecules is of utmost importance. To accomplish this there are several methods known to date; the three most widely used being X-ray crystallography, nuclear magnetic resonance spectroscopy and cryo-electron microscopy (CryoEM). The latter is the method of choice for large macromolecular complexes. Three dimensional structure determination based on micrographs recorded using state of the art electron microscopes requires the combination of different, sophisticated, computing time intensive algorithms. Due to improved camera systems and recording times the number of micrographs produced is steadily increasing. While this theoretically enables to push the resolution limits of obtained structures it also requires all involved methods and techniques to evolve and improve as the sheer mass of data can not be handled manually anymore. While the computational speed of all techniques limits the overall feasibility the quality of those algorithms has a major impact on the quality of reconstructed three dimensional volumes. In this work a novel reference free particle picking software is presented, that enables scientists to cope with the new challenges offered by the huge amount of data available. This algorithm automatically identifies particles in micrographs reliably and writes them to a single file on a hard drive. A single particle image processing framework is introduced that unifies the workflow of CryoEM and offers techniques and algorithms to calculate three dimensional structures from single particle images. As part of this imaging framework an algorithm was developed that automatically corrects single particle images for the contrast transfer function, that is induced due to spherical aberration of optical devices and defocussing the electron beam of the electron microscope to obtain better phase contrast during image...



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